RTCA Special Committee 209

Working Group #1

Mode S Transponder MOPS Development/Maintenance

Meeting #3

Engility Corporation, Washington DC

Proposed Transponder Labeling Method Based on Equipment Level and Installed Optional Additional Features.

(Action Item 7-12)

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SUMMARY
This Working Paper proposes to include, in Section 1 of RTCA/DO-181D, a method for labeling the Mode S Transponder based on equipment Level, Minimum Peak Output Power and installed optional additional features. It is intended that the transponder TSO will refer to this section as a labeling requirement in addition to the standard TSO marking requirements of 14 CFR 21.607.

1.0 Introduction

In response to Action Item 7-12, this working paper proposes the addition of a new subsection into section 1 of RTCA Document DO-181D to provide guidance to the manufacture on how to label their transponder based on transponder level, installed optional additional features, and minimum peak output power. It is intended that the revised transponder TSO (TSO-C112c) will refer to this labeling guidance in regards to required equipment marking. It is also intended that this labeling scheme will be harmonized with that which will be approved in the revision to EUROCAE Document ED-73C.

Changes to proposed DO-181D include the deletion of §1.4.3.6 and a new §1.4.4, §1.4.5, and §1.4.6 as follows:

1.4.3 Mode S Transponder Levels…

1.4.3.1 Level 1 Transponders…

1.4.3.2 Level 2 Transponders…

1.4.3.3 Level 3 (Enhanced Data Link Protocol Capability)…

1.4.3.4 Level 4 Transponders (Full ELM Capability)…

1.4.3.5 Level 5 Transponders (Enhanced Data Link Protocol Capability)…

~~**1.4.4Minimum Output Power Level Designation**~~

~~Two minimum peak output power levels are supported by this document, 125 watts (21.0 dBW), which is designated by an "A," and 70 watts (18.5 dBW), which is designated by a "B." For more information on output power level see §2.2.3.2.~~

~~**1.4.5**~~**1.4.4 Optional Additional Features**

Some transponder installations may support additional features:

• **TCAS Compatibility** – TCAS compatible transponders will have the capabilities of §1.4.3.2, §1.4.3.3, §1.4.3.4 or §1.4.3.5, (see §2.2.22).

• **Antenna Diversity** – in large aircraft or co-installation with airborne collision avoidance systems may require the transponder to operate in the diversity mode, i.e., the use of two antennas, receivers and transmitting channels.

• **Extended Squitter** – extended squitter transponders will have the capabilities of §1.4.3.2, §1.4.3.3, §1.4.3.4 or §1.4.3.5 in addition to those requirements prescribed for extended squitter operation (see §2.2.23).

• **Dataflash Application** – transponders implementing dataflash mode will adhere to the requirements contained in Appendix C.

• **Hijack Mode Capability** – transponders implementing the hijack mode will adhere to the requirements contained in Appendix D.

• **Elementary Surveillance** – elementary surveillance transponders will have the capabilities of §1.4.3.2, §1.4.3.3, §1.4.3.4 or §1.4.3.5 in addition to those requirements prescribed for elementary surveillance operation (see §2.2.24).

• **Enhanced Surveillance** – enhanced surveillance transponders will have the capabilities of §1.4.3.2, §1.4.3.3, §1.4.3.4 or §1.4.3.5 in addition to those requirements prescribed for enhanced surveillance operation (see §2.2.25).

• **Surveillance Identifier Code (SI)** – transponders with the ability to process SI codes have the capabilities of §1.4.3.2, §1.4.3.3, §1.4.3.4 or §1.4.3.5, (see §2.2.14.4.37).

These additional features and corresponding identification codes are summarized in the following table:

Additional Feature	ID Code
TCAS Compatibility	**a**
Antenna Diversity	**d**
Extended Squitter	**e**
Dataflash	**f**
Hijack Mode Capability	**h**
Elementary Surveillance	**l**
Enhanced Surveillance	**n**
Surveillance Identifier Code (SI)	**s**

1.4.5 Minimum Output Power Level Designation

Two minimum peak output power levels are supported by this document, 125 watts (21.0 dBW), which is designated as Class 1 equipment, and 70 watts (18.5 dBW), which is designated as Class 2 equipment. For more information on output power level see §2.2.3.2.

1.4.6 Transponder Labeling

Each transponder shall be clearly labeled with its actual functional level, minimum peak output power, and its optional additional features. The label shall contain the word "Level" followed by one digit between 1 and 5 (see §1.4.3.1 thru §1.4.3.5), ~~followed by the transponders' minimum peak output power designation of "A" or "B" (see §1.4.4), and~~ followed by the ID codes for the incorporated optional additional features as shown in the table in §1.4.~~5~~4,

~~.~~followed by the transponders' minimum peak output power designation as "Class 1" or "Class 2" (see §1.4.5),

Example No. 1 - For a level 2 transponder ~~with a minimum peak output power of 70 watts (18.5 dBW)~~ that incorporates extended squitter and elementary surveillance capability with a minimum peak output power of 70 watts (18.5 dBW); the transponder would be labeled "Level 2el, Class 2".

Example No. 2 - For a level 4 transponder ~~with a minimum peak output power of 125 watts (21.0 dBW)~~ that incorporates TCAS compatibility, antenna diversity, extended squitter and enhanced surveillance capability with a minimum peak output power of 125 watts (21.0 dBW) that incorporates; the transponder would be labeled "Level 4aden, Class 1".

The label should be clearly visible when the transponder is mounted on the aircraft. In the case of a change of transponder level or capability the label must be changed appropriately.

***NOTE:** For transponders where "Level" or "additional feature" might be changed through an approved software update, a means to display the labeling electronically would meet the above intent.*

1.4.7 Use of the Mode S Data Link (renumber from here down)